WHAT IS CLAIMED IS:

1. A device selected from the group of devices consisting of an electric motor, an electric generator, and a regenerative electric motor, the device comprising:

at least one stator arrangement having a plurality of electromagnetic assemblies with each electromagnetic assembly including at least a portion of a magnetic core that is formed from thin film soft magnetic material, the electromagnetic assemblies defining a plurality of stator poles, and

at least one rotor arrangement supported for rotation about a given rotational axis at a certain range of normal operating rotational speeds, the rotor arrangement including a plurality of rotor poles for magnetically interacting with the stator poles, the rotor poles being supported for rotation about the rotational axis along a circular path, and

a switching arrangement for controlling the electromagnetic assemblies, the switching arrangement being configured such that the switching arrangement is able to cause the stator poles of the electromagnetic assemblies to magnetically interact with the rotor poles of the rotor arrangement within a certain range of frequencies, the number of rotor poles being such that the switching arrangement causes the stator poles of the electromagnetic assemblies to magnetically interact with the rotor poles of the rotor arrangement such that the ratio of the frequency of the device in cycles per second relative to the revolutions per minute of the device is greater than 1 to 4 during the operation of the device.

2. A device according to claim 1 wherein the rotor arrangement includes at least 30 rotor poles.

3. A device according to claim 1 wherein the stator arrangement includes at least 48 stator poles.

4. A device according to claim 1 wherein the device is a radial gap device.

5. A device according to claim 1 wherein the thin film soft magnetic material is a nano-crystalline material.

6. A device according to claim 1 wherein the device is a device selected from the group of devices consisting of a switched reluctance device, an induction device, or a permanent magnet device.

7. A device according to claim 1 wherein the device is a multiple phase device.

8. A device according to claim 1 wherein

the device is a radial gap device, and

the electromagnetic assemblies include independent U-shaped one-piece magnetic cores, each electromagnetic assembly defining two stator poles located at opposite ends of the one-piece magnetic core, each one-piece magnetic core providing the entire magnetic return path for the two opposite magnetic stator poles associated with each electromagnetic assembly, the electromagnetic assemblies being positioned around the circular path of the rotor poles, each electromagnetic assembly being positioned such that the two stator poles of each electromagnetic assembly are located adjacent to one another and in line with one another along a line that is parallel with the rotational axis of the device.

9. A device according to claim 8 wherein the rotor poles are pairs of rotor poles formed from adjacent

pairs of permanent magnet segments configured to form rotor poles of opposite magnetic polarity, each pair of permanent magnet segments being positioned such that the two permanent magnet segments are located adjacent to one another and in line with one another along a line that is parallel with the rotational axis of the device such that the two permanent magnet segments define two adjacent circular paths around the rotational axis of the device when the rotor is rotated about the rotational axis of the device, each of the two adjacent circular paths facing an associated one of the stator poles of each electromagnetic assembly.

10. A device according to claim 9 wherein the rotor arrangement includes at least 36 pairs of adjacent rotor poles.

11. A device according to claim 8 wherein the stator arrangement includes at least 48 electromagnetic assemblies.

12. A device according to claim 8 wherein the stator poles face inward toward the rotational axis of the device.

13. A device according to claim 8 wherein the stator poles face outward away from the rotational axis of the device.

14. A method of operating a device selected from the group of devices consisting of an electric motor, an electric generator, and a regenerative electric motor, the device comprising:

providing at least one stator arrangement having a plurality of electromagnetic assemblies with each electromagnetic assembly including at least a portion of a magnetic core that is formed from thin film soft magnetic material, the electromagnetic assemblies defining a plurality of stator poles, and

providing at least one rotor arrangement and supporting the rotor for rotation about a given rotational axis at a certain range of normal operating rotational speeds, the rotor arrangement including a plurality of rotor poles for magnetically interacting with the stator poles, the rotor poles being supported for rotation about the rotational axis along a circular path, and

using a switching arrangement to control the electromagnetic assemblies, switching the stator poles of the electromagnetic assemblies to magnetically interact with the rotor poles of the rotor arrangement within a certain range of frequencies, the number of rotor poles being such that the stator poles of the electromagnetic assemblies magnetically interact with the rotor poles of the rotor arrangement such that the ratio of the frequency of the device in cycles per second relative to the revolutions per minute of the device is greater than 1 to 4 during the operation of the device.

15. A method according to claim 14 wherein the rotor arrangement includes at least 30 rotor poles.

16. A method according to claim 14 wherein the stator arrangement includes at least 48 stator poles.

17. A method according to claim 14 wherein the device is a radial gap device.

18. A method according to claim 14 wherein the thin film soft magnetic material is a nano-crystalline material.

19. A method according to claim 14 wherein the device is a device selected from the group of devices consisting of a switched reluctance device, an induction device, or a permanent magnet device.

20. A device according to claim 14 wherein the device is a multiple phase device.

21. A method according to claim 14 wherein

the device is a radial gap device, and

the electromagnetic assemblies include independent U-shaped one-piece magnetic cores, each electromagnetic assembly defining two stator poles located at opposite ends of the one-piece magnetic core, each one-piece magnetic core providing the entire magnetic return path for the two opposite magnetic stator poles associated with each electromagnetic assembly, the electromagnetic assemblies being positioned around the circular path of the rotor poles, each electromagnetic assembly being positioned such that the two stator poles of each electromagnetic assembly are located adjacent to one another and in line with one another along a line that is parallel with the rotational axis of the device.

22. A method according to claim 21 wherein the rotor poles are pairs of rotor poles formed from adjacent pairs of permanent magnet segments configured to form rotor poles of opposite magnetic polarity, each pair of permanent magnet segments being positioned such that the two permanent magnet segments are located adjacent to one another and in line with one another along a line that is parallel with the rotational axis of the device such that the two permanent magnet segments define two adjacent circular paths around the rotational axis of the device when the rotor is rotated about the rotational axis of the device, each of the two adjacent circular paths facing an associated one of the stator poles of each electromagnetic assembly.

23. A method according to claim 22 wherein the rotor arrangement includes at least 36 pairs of adjacent rotor poles.

24. A method according to claim 21 wherein the stator arrangement includes at least 48 electromagnetic assemblies.

25. A method according to claim 21 wherein the stator poles face inward toward the rotational axis of the device.

26. A method according to claim 21 wherein the stator poles face outward away from the rotational axis of the device.

27. A method of making a device selected from the group of devices consisting of an electric motor, an electric generator, and a regenerative electric motor, the device comprising:

providing at least one stator arrangement having a plurality of electromagnetic assemblies with each electromagnetic assembly including at least a portion of a magnetic core that is formed from thin film soft magnetic material, the electromagnetic assemblies defining a plurality of stator poles, and

providing at least one rotor arrangement and supporting the rotor for rotation about a given rotational axis at a certain range of normal operating rotational speeds, the rotor arrangement including a certain number of rotor

poles for magnetically interacting with the stator poles, the rotor poles being supported for rotation about the rotational axis along a circular path, and

providing a switching arrangement for controlling the electromagnetic assemblies, the switching arrangement being configured such that the switching arrangement is able to cause the stator poles of the electromagnetic assemblies to magnetically interact with the rotor poles of the rotor arrangement within a certain range of frequencies, and

selecting the number of rotor poles to be a number such that the ratio of the frequency of the device in cycles per second relative to the revolutions per minute of the device is greater than 1 to 4 during the operation of the device.